

ANNUAL REPORT OF THE BIRLA INDUSTRIAL &  
TECHNOLOGICAL MUSEUM FROM JANUARY TO  
DECEMBER, 1966

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A. AIMS AND OBJECTS

The main objectives of this museum are :

- 1) to portray the history of science & technology ;
- ii) to create scientific awareness among the common people ;
- iii) to supplement science education in schools.

B. MUSEUM GALLERIES

Since its opening in May, 1959 the museum has been able to set up as many as 10 well-equipped galleries on the following subjects :

- |                    |                             |
|--------------------|-----------------------------|
| 1. Nuclear Physics | 6. Petroleum                |
| 2. Motive Power    | 7. Iron & Steel             |
| 3. Popular Science | 8. Electricity              |
| 4. Mining          | 9. Television & Electronics |
| 5. Copper          | 10. Communication           |

There are Guide Lecturers in each gallery for demonstration of exhibits to the visiting public. Special conducted tours are arranged for batches of school and college students. There are large number of working and animated exhibits in each gallery.

C. CHANGES IN THE GALLERIES

Motive Power : The thoroughly renovated gallery on 'Motive Power' has been re-opened to the visitors on Friday, December 9, 1966. With the help of a number of static and working models, dioramas and demonstration exhibits, arranged in two halls, the re-organised gallery seeks to convey to the visitors a systematic development of Motive Power (Power that actuates Motion), since the earliest times.

The first hall begins with a series of dioramas depicting the story of man's early sources of power - power of his own muscles, tamed animals, wind and flowing water, which continued for thousands of years from his primitive existence. Apparently, these sources had inherent limitations. Only after the discovery of Coal and Petroleum man gradually invented practical means to convert heat energy into motive power. The historical development of steam engines (which actually ushered in the Industrial Revolution in Europe) has been depicted in chronological order. This series includes models of engines of historical importance, like models of Newcomen's atmospheric engine, which once saved the coal mines in U.K. from flooding, the revolutionary rotative beam engine of James Watt, and Trevithick's high pressure engine which is the fore-runner of modern locomotives. Along with these the development of steam engine valves, boilers, steam turbines etc. are depicted with arrays of models, actual objects etc. A model of pulverised coal fired steam generating set, similar to one of Bandal Thermal Power Plant, and a fan powered by a hot air engine, enrich the collections of this hall.

The next hall begins with models showing the working principles of different types of Internal Combustion Engine. In this hall, a chart showing the historical development of Diesel engine, Indian-built automobile engine, Marine and ~~Diesel~~ aero engines are displayed in a series which also includes actual objects showing the development of spark-ignition and fuel injection systems. A worthy feature of this series is a set of working models of experimental rotary engines which will empower vehicles of tomorrow. In the next series it is explained how the energy of flowing water is being harnessed from ancient times

as an important source of motive power by means of dioramas, models of old water wheels and ~~powerhouses~~ of modern turbines, charts and working models of hydel power plants etc. The other interesting exhibits of this hall are the models showing transmission of power by belts, friction gears, link mechanisms and gear mechanisms.

The future sources of power such as nuclear energy have been shown with the help of a model of a nuclear power reactor.

A list of exhibits placed in this gallery is given in annexure I.

D. ADDITION OF EXHIBITS TO THE GALLERIES :

a) Mining Gallery :-

i) Pit top layout :- This is a working model showing the use of traverser and tippler.

ii) Improved Lofco Plant :- This working model of surface layout shows two car tipplers on both sides of the shaft.

iii) Lofco Plant :- This working surface layout shows the use of traversing tippler and hydraulic ram.

iv) Skip loading :- This model shows underground loading arrangement in a bottom discharge skip.

v) Axial flow fan :- This is a working model of a modern ventilating fan whose blades are aero-foil and air flows axially along the fan.

b) Iron & Steel Gallery :-

Sectional model of Coke-oven :- This is a sectional model of Coke-oven battery where details of its construction and working can be studied.

c) Nuclear Physics Gallery:-

The model of the Indian Reactor 'Apsara' was added to the gallery. This first reactor to go into operation in India is of the swimming pool type, where radioisotopes are produced.

d) Popular Science Gallery :-

Parallel Mirrors :- The exhibit shows that mirrors placed at 180° to each other i.e. parallel, give an infinite number of images with decreased clarity as the number increases.

e) Electricity Gallery :-

i) Cable manufacturing plant:- This working model was earlier acquired from Technivision Limited Berke, U.K. It demonstrates, through push button switch, how a typical multi-wire plastic coated electric cable is manufactured stage by stage.



- ii) Cui-Section Ceiling fan motor :- An actual 48" ceiling fan sectional at 120 degree angle.

f) Communication Gallery:-

Baudot Telegraph accessories consisting of :

- i) Baudot Key Board
- ii) Baudot Relay
- iii) Baudot Tape Transmitter
- iv) Baudot Synchronised Distributor
- v) Baudot Receiver with Base
- vi) Baudot Keyboard Perforator

The above Baudot Telegraph equipments have been acquired from the P & T workshop, Alipora.

The Baudot Printing Telegraph system working on 5 unit code of Gauss and Weber, was first developed in France in 1874 and had extensive use till 1930's when its use began to decline, and now totally replaced, with the advent of multi-channel voice Frequency telegraphy and Teleprinter instrument in telegraphy. The ~~Teleprinter~~ important accessories of the system have been acquired from the P & T Department.

E. EXTENSION SERVICE

Setting up of Mobile Science Museum

- a) One of the most important items recently added to the activities of the museum is the introduction of Mobile Science Museum. The benefit of this museum is mostly confined to city dwellers or at best who could afford to visit the city. The Mobile Science Museum originated with the idea of taking science museum deep into the rural area.

Mobile Science Museum is one such successful extension service programme organised for the first time in India by BITM, Calcutta. Since its inauguration on November 17, 1965, there has been continuous demand for the same. The first exhibition entitled 'Our Familiar Electricity' explains through 30 working exhibits the basic theory of electricity and electrical appliances. The exhibits are carried by lorry to interior schools and temporary exhibitions are held there on specially designed flexible stands which could be packed up or set in position in no more than an hour time. In 1966, this set travelled through 25 schools in the districts of 24-parganas, Howrah, Hooghly and Nadia. More than two lakhs of people including students visited these exhibits.

Besides, popular scientific film shows, popular lectures etc were also arranged in each place of exhibition.

b) Mobile Science Exhibition in Museobus

The above mobile science exhibition took a unique shape on December 26, 1966, when for the first time in India a 'Museobus' carrying the 2nd set of exhibits on 'Transformation of Energy' left the museum premises for the first exhibition site at Barsul Vijnan Mandir, Burdwan, about 70 miles from Calcutta. This specially designed 30'x 7' 'Museobus' or a museum on wheels, which itself serves as the exhibition hall, is a new device of the BITM to carry the message of science to the remote corners of the country. 28 working exhibits in the 'Museobus' vary in subject although they all tell the story of a single entity

namely energy; and on the possibility of transforming the various forms of energy into one another. Illustrative posters, models, demonstration equipments etc have been used for the purpose. The exhibition covers a wide range of field starting from 'Solar Energy' to 'Space Rocket'.

Themes presented by the exhibits include, among others, the following : Muscle power and tools, Future source of energy. An atom has enormous power, Sun-rays make electricity etc.

The 'Museobus' after its first exhibition at Barsul Vijnan Mandir will proceed to Memari, Kalna, Nabadwip and Katwa areas. In the second phase the bus will travel to Asansol and cover the whole Burdwan district in about 5 months. A list of exhibits on 'Transformation of Energy' is given in annexure 2.

c) Temporary exhibitions

Exhibitions

SAMPLE SCIENCE MUSEUM : This museum along with the VITM, Bangalore, participated in setting up a Sample Science Museum at National Museum, New Delhi, during the UNESCO Regional Seminar on 'Development of Museums' from January 31 to February 10, 1966. It was organised jointly by the above two Science Museums of Calcutta and Bangalore in order to give an opportunity to the participants and observers of the UNESCO Seminar on Museums to study different aspects of a Science Museum. Representative types of exhibits displayed now a days in eminent Science Museums of the world were selected for the exhibition. Attention was paid not only to the selection of exhibits but also to the display, write-ups, illumination, animation and all sorts of techniques adopted in a Science Museum. The Sample Science Museum set up there represented all aspects of a real Science Museum but in a miniature scale. The International Delegates of the UNESCO Museum Seminar and most of the school and college students of Delhi area visited this Sample Science Museum.

List of models and exhibits at Annexure 4.

A list of exhibits is given in annexure 3.

F. OTHER ANCILLARY ACTIVITIES

Besides display of models and exhibits in the galleries, the following facilities are also provided by the museum with a view to promote scientific and technical knowledge.

a) Film shows :- The necessity of adopting audio-visual methods in imparting knowledge to the people is well recognised. Popular Scientific and Technical shows are held in the museum 8 times a week. These are well attended. Besides the above regular shows, some special film shows were arranged in the museum with the films borrowed from United States Information Services, The British Council, Film Division, Govt. of India.

b) Popular Lectures :- 1) 5 popular lectures were arranged in the auditorium by inviting some eminent scientists and speakers to talk on different branches of science.

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c) Temporary exhibitions

BITM participated in the following four temporary exhibitions arranged by outside organisations as follows :-

	<u>Name of the organisation</u>	<u>Duration of exhibition</u>	<u>No. of exhibits displayed</u>	<u>No. of visitors</u>
a)	Bangiya Bigyan Parishad, Calcutta-9.	Feb. 12-20, 1966	16	1600
b)	Science for Children, Rabindra Sarabar, Cal.	April 13-19, 1966	10	3000
c)	Picnic Park Recreation Club, Picnic Park, Cal-19	July 17-23, 1966	15	5000
d)	Hooghly Institute of Technology, Hooghly.	Sept. 15-18, 1966	15	3400
				<u>13,000</u>

A list of exhibits is given in annexure 3.

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b) Popular Lectures :- 1) 5 popular lectures were arranged in the auditorium by inviting some eminent scientists and speakers to talk on different branches of science.

ii) 4 popular lectures on 'Man's conquest of Space' were arranged for school students in museum auditorium/schools.

c) Lecture demonstrations (in the museum premises)

I) In this programme subjects are chosen from the school syllabus and they are explained with the help of working models and exhibits so that the students can easily understand the difficult subjects. Each lecture lasts nearly for an hour. 40 schools in an around Calcutta participated in the lecture demonstration programme of the museum on the following subjects :-

i) Basic principle of electrical generator and electrical motor.

ii) The story of atom.

iii) Heat and Steam engine.

iv) Light and our eyes.

II) Lecture demonstrations (outside museum premises)

Lecture demonstrations on the above subjects are being organised by the museum in schools outside Calcutta.

d) Temporary exhibitions (inside the museum premises)

A science exhibition was organised for the children and visiting public of the Museum at the Reception Hall of the Museum. The exhibits were mostly on popular science depicting the various scientific principles and mechanisms of modern technology. Natural science was also included and a few rare and exclusive specimens were also displayed in a ecological style. Stuffed specimen had been collected from the Zoological Section of the Indian Museum (Zoological Survey of India) on loan to cover up this section of the exhibition which was open to the public from May 3 to 10, 1966 during Museum hours.

## G. STUDENTS' SEMINAR

The Second Competitive Students' Seminar on the subjects : Origin of Man, Physiological and Psychological effects of space flight, and Life in outer space, was organised by BITM, Calcutta on September 19, 1966 with an object to popularise Science amongst school students.

As many as thirty-nine students from different reputed schools, in and around Calcutta, participated in the seminar. Many educationists, heads of schools and guardians of the students also attended. Prizes will be awarded to the winners and certificates to all participants.

## H. TRAINING FACILITIES

a) 10 students of the Department of Museology, University of Calcutta, attended a training course in this museum from April 18, 1966 to April 23, 1966. They were given practical training in diorama making display, lighting, tools and machines, show case designs labelling, classification of exhibits in a science museum, organisation of Mobile Science Museum etc. Film shows and special discussions were also arranged for them.

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b) Creative Abilities Centre

A 'Creative Abilities Centre' for school students has been started in the museum from November, 1966. Its main object is to develop scientific aptitudes among the students and to encourage them to prepare models and exhibits on scientific subjects. Museum provides all possible help in the form of technical instructions, loan of tools, use of machines etc required for the trainees. So far, 40 students have joined the Centre where various projects on Physics, Astronomy and Biology have been taken up initially.

I. GENERAL INFORMATION ABOUT THE MUSEUM

Decoration of the Reception Hall :

a) A mural ~~painting~~ painting (20'x8') now adorns the eastern wall of the Reception Hall. The subject of the mural is the evolution of science from the conquest of fire to the rocket age with portraits and work of eminent scientists.

b) Library:- The stock of the library comprises books on science and technology. In view of the dearth of good technical public libraries in the vicinity, it was considered fit to open the stock to outsiders so that maximum benefit could be derived from the stock. So, the library was opened to the public ~~from~~ on July 6, 1966 and so far 227 members, mostly students, have been using it as a reading room to their advantage. The stock of books, periodicals, films etc in the library are as follows :-

have enlisted as members of the library and have been

Books	...	...	3922
Important journals received	..	93	
Tech. films	...	...	111
Pamphlet	...	...	1807
Photographs	...	...	1000
Bound periodicals	...	...	317

c) Attendance :- i) The attendance of visitors in the museum was 1,60,872 including 352 organised groups covering 13,185 students from different institutions of the country.

ii) More than 2 lakhs of people including students visited the Mobile Science Museum Exhibitions arranged by the museum in different places of West Bengal.

iii) 13,000 people visited the temporary exhibitions in which BITM participated.

d) Admission : Tuesdays to Saturdays ..... Free  
Sundays ... 0.25 paise (for general public)

0.05 paise each (for organised student groups)

e) Museum Hours : 10.00 a.m. to 3.30 p.m.

Open every day except Mondays and notified holidays.

J. PUBLICATIONS :

- (a) An illustrated brochure, Motive Power Gallery.
- (b) A priced 'Guide Book' to the museum in Bengali.
- (c) A priced 'Guide Book' to the museum in Hindi.
- (d) A folder in English on Mobile Science Museum titled 'Transformation of Energy'.
- (e) A folder in Bengali on Mobile Science Museum titled

K. DISTINGUISHED VISITORS :

<u>Name</u>	<u>Date of visit</u>
1. Mr. J. Van Ettinger, Executive President, Building Centre, Rotterdam (Netherland)	February 8, 1966.
2. Mr. Joseph A. Patterson, Director, American Association of Museums, U.S.A.	February 20, 1966.
3. Mr. W.R. Piggott, OBE, Senior Official at the Radio Research Station at Slough, U.K.	March 8, 1966.
4. Dr. Oner Bambetovich Jamalov, Director, The Institute of Economics in the Academy of Sciences, Uzbekisthan, U.S.S.R.	April 28, 1966.
5. Shri Rabindra Lal Sinha, Education Minister, Govt. of West Bengal.	July 21, 1966.
6. Dr. B. Malik, Vice-Chancellor, Calcutta University.	July 21, 1966.
7. Dr. J.P. Harding, Keeper of Zoology, British Museum (Natural History), London.	August 12, 1966.
8. Dr. Maurice Goldsmith, Director, Science and Science Foundation, London.	September 4, 1966.
9. Mr. Kennedy Schmertz, Smithsonian Institution, U.S.A.	October 22, 1966.
10. Mr. Victor K. McELHENY, European Correspondent, Science, London.	October 29, 1966.
11. Dr. Sergei Victorovich Meyen, U.S.S.R. Scientist.	November 1, 1966.
12. Dr. Christian Lehmann, Director, Institute of Cultivated Plant Research, East Germany.	November 8, 1966.

Construction

1. A hall in the ground floor to be used for the exhibits of Transport Gallery.
2. A temporary shed for Carpentry and Painting Section.

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Members of the Executive Council, BITM

Chairman

1. Shri M. P. Birla, 15, India Exchange Place, Calcutta-1.

Members

2. Dr. T. Sen,  
Vice-Chancellor, Banaras Hindu University, Banaras.
3. Sir. H.K.Lindsay,  
Managing Director, Metal Box Co. of India Ltd.,  
59C, Chowringhee Road, Calcutta-20.
4. Rev. Father Dr. H. Santapau,  
Director, Botanical Survey of India  
14, Madan Street, Calcutta-13.
5. Dr. (Mrs.) Grace Morley,  
Adviser on Museums, Ministry of Education,  
C/o. National Museum, Janapath, New Delhi.
6. Shri T.R.Gupta,  
Chairman, Heavy Engineering Corp. Ltd. Ranchi.
7. Dr. Moti Chandra,  
Director, Prince of Wales Museum of Western India, Bombay.
8. Shri J.V.Jardine Patterson,  
M/s. Jardine Henerason Ltd., 4, Clive Row, Calcutta-1.
9. Shri N.V.Shenoi,  
Deputy Director General (Long distance)  
P & T, Directorate, New Delhi.
10. Dr. B.D.Nag Chowdhury,  
Director, Saha Institute of Nuclear Physics,  
92, Acharyya Prafulla Road, Calcutta.
11. Dr. Atma Ram,  
Director General, Scientific & Industrial Research, New Delhi-1.
12. F.A. to CSIR, Rafi Marg, New Delhi-1.
13. Shri S.K.Ghose,  
Curator-in-Charge, Birla Industrial & Technological Museum. Cal.

Scientific Advisory Committee

1. Dr. T. Sen,  
Vice-Chancellor, Banaras Hindu University, Banaras.
2. Dr. Atma Ram,  
Director General,  
Scientific & Industrial Research, Rafi Marg, New Delhi-1.
3. Dr. B.D.Nag Chowdhury,  
Director, Saha Institute of Nuclear Physics,  
92, Acharyya Prafulla Road, Calcutta.
4. Dr. (Mrs.) Grace Morley,  
Adviser on Museums, Ministry of Education  
C/o. National Museum, Janapath, New Delhi.



5. Prof. G.C.Sen,  
Professor-in-Charge,  
Mechanical Engg. Department,  
Jadavpur University.
6. Dr. Sankar Sevak Boral,  
Professor of Communication, B.E. College.
7. Surti S.N.Ghosal,  
Assistant Professor,  
Govt. College of Arts & Crafts.
8. Surti A. Bose,  
Officer-in-Charge,  
Visvesvaraya Industrial & Technological Museum,  
Kasturba Road, Bangalore-1.
9. Mr. R. Subramanian,  
Assistant Curator,  
Birla Planetarium.
10. Shri S.K.Ghose,  
Curator-in-Charge,  
Birla Industrial & Technological Museum,  
Calcutta.

Members of Building & Finance Sub-Committee

1. Shri M.P.Birla,  
Chairman, Executive Council.
2. Dr. T.Sen,  
Vice-Chancellor, Banaras Hindu University, Banaras.
3. Shri A. Bose,  
Officer-in-Charge,  
Visvesvaraya Industrial & Technological Museum, Bangalore.
4. The Superintending Engineer,  
C.P.W.D.
5. Shri S.K.Ghose,  
Curator-in-Charge, Birla Industrial & Technological Museum
6. Secretary,  
Council of Scientific & Industrial Research,
7. E.A. to CSIR, New Delhi.



PROFORMA 'A'

(Filled up against each item as December 31, 1966)

1. Research papers published in		
Indian Journals		
Foreign Journal	Nil	
2. Patents Filed:		
In India		
In Other Countries	Nil	
3. Books, monographs, symposia proceedings, reports and other publications	...	Already included in the report.
4. Name of Periodicals and their frequency	....	nil
5. Processes utilised by industry for production during the year	....	nil
6. Processes Leased to industry :		
On royalty/premia basis		
Rs Free of cost		nil
7. Processes ready for industrial utilisation during the year.		nil
8. CSIR Research Fellows working :		
Senior		
Junior		
9. Non-CSIR Research Fellows/Scholars working		nil
10. Scientists' Pool Officers		nil
11. Retired Scientists		nil
12. Staff :		
Scientific (Junior Scientific Assistant and above)	... ..	33
Auxilliary (Technical)	... ..	71
Administrative & House Keeping	... ..	38
Class IV	... ..	68
	Total	210

Annexure. I

Exhibits of Motive Power Gallery

1. Diorama showing the use of human muscle power as man's earliest source of Motive Power.
2. Diorama showing how combined muscle power with simple mechanical devices increased man's power to do bigger and difficult jobs.
3. Diorama showing how the muscle power of domesticated animals is used by man to do work for him since the long past.
4. Diorama showing the use of wind mill as an example of man's harnessing of wind power from early times.
5. Diorama showing a common scene of rural Bengal. The use of human muscle power and small tools in cottage industries are depicted.
6. Model of Hero's Aeolipile. 150 BC

It was the earliest known design of a contrivance operated by steam power. It was designed to work like a reaction type turbine.

7. Model of Porta's Apparatus - 1601 AD

The model shows how the pressure of steam could be used to force up water from a closed tank.

8. Model of Branca's Steam Engine - 1629 AD

This is an early design of a model to work like an impulse type steam turbine. A jet of steam from a boiler acting upon the buckets of the wheel, which in turn rotates on its shaft and drives a gear arrangement to operate a pestle and mortar.

9. Model of Papin's Digester - 1680 AD

The model shows the first use of steam safety valve in a steam pressure cooker. This was a landmark in the history of the development of steam boilers. Henceforward the use of safety valves became universal in making boilers.

10. Model of Papin's Engine - 1690 AD

This was one of the first conceptions of steam engine with a piston and cylinder. The pressure of the steam acts upon the piston to give motion.

11. Model of Savery's steam engine - 1702 AD

This is the model of first practical mine pump, worked by the pressure of steam generated in boiler. It had no piston. It was used for pumping out water from mines.

12. Model of Newcomen's Steam Engine - 1739 AD

This is the model of first practical beam type steam engine with piston and cylinder used to work pumps raising water from coal mines.

13. Model of Oscillating cylinder steam engine-Murdock-1784 AD

This is the model of an oscillating cylinder steam engine showing the first use of slide valves to control the direction of the flow of steam in the cylinder of a double acting steam engine.

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14. Model of Watt's steam engine - 1788 AD

This is a scale model of the famous beam type rotative steam engine which ushered in the industrial revolution in Europe in 19th Century. It is a double acting engine i.e. in its cylinder the steam acted on both sides of its piston guided by the valves arrangements. Special features in this engine are the inclusion of a separate condenser, planetary type ~~xxxxi~~ rotating devices of its main shaft from reciprocating motion the overhead beam of the engine.

15. Model of Cartwright's steam engine - 1798 AD

This engine by Cartwright was conspicuous for its having a separate condenser for feeding back the condensed steam to the boiler. This economised the fuel consumption of engines.

16. Model of Trevithick steam engine . 1803 AD

This was the first high pressure double acting compact type steam engine designed and developed by Trevithick. It was the forerunner of presentday steam locomotives.

17. Model of Grasshopper engine . 1861 AD

This was a direct acting steam engine in which further progress was shown by reducing the loss of power due to friction by some new mechanical arrangements. .

18. Model of Willan's high speed engine - 1885 AD

This type of engine was patented by P.W. Willan in 1884. With subsequent modification, it was extensively adopted for the direct driving of dynamo.

19. Model of Uniflow engine

This model shows the working principle of uniflow engine which drives its name from the unidirectional flow of steam from inlet to exhaust.

20. Marshall steam engine - 1891 AD

This is an actual vertical type single cylinder steam engine with slide valve and pickering type governor. Here it is rotated by a concealed electric motor.

21. High speed steam engine - Lindley

This is a vertical type single cylinder high speed steam engine fitted with a piston-type valve. It is coupled to a D.C. Generator for generating electricity. The exhibit is illuminated to show the internal views of the engine.

22. An working toy model of steam engine

This model is operated by steam produced inside the toy boiler by heating water electrically.

23. Sectional model of steam engine for demonstration purpose

This model is meant for demonstration to show the relative operations of piston, slide valve and speed control governor of a steam engine.

24. Model of a Marine steam engine

This is a working model of a two cylinder marine type steam engine fitted with stephenson valve gear etc.

25. Model of Eight different types of valves for use in different types of steam engines.

These are different types of valves required to control the flow of steam inside the cylinders of engines.

26. Model of Walshaerts valve - gear

It is a radial valve gear invented and developed by Egide Walschaerts in Belgium in the mid-nineteenth century for use in locomotive engines. At present this type of valve gear is mostly used in the steam locomotives.

27. Model of Howes valve - gear 1851 AD

This is a two eccentric reversing gear designed by Howe for use in locomotive engine before the invention of Walschaerts gear.

28. Model of Rateau steam turbine - 1908 AD

This is a multistage steam turbine developed by A.C.E. Rateau in France in the last decade of the 19th Century.

29. Steam turbine (with D.C. generator)

This is an actual steam turbine coupled with a generator.

30. Steam turbine blades on board.

Different types of steam turbine blades displayed on a board.

31. Rotor blades of steam turbine

These blades are used in a steam turbine of 250 M.W. at 3000 r.p.m.

32. Model of Wagon Boiler - 1780 AD

These are boilers with stays, used for Watt engines and survived until the middle of the 19th Century.

33. Model of Haystack Boiler - 1850

This is a vertical boiler with stays inside. Because of its shape of a haystack it is named Haystack boiler.

34. Model of Loco Type Boiler

This is a multipile fire tube boiler, invented by Seguin in France and by the Stephansons in England. This is a modification of locomotives boiler for use as a stationery boiler.

35. Model of Lancashire Boiler

These are shell type boilers with greater capacity patented in 1844 by W. Fairbairn and J. Hetherington of Manchester.

36. Model of Babcock and Wilcox boiler

This is a water-tube type boiler with natural circulation. It was patented in 1867 by G.H. Babcock and S. Wilcox of America.



37. Model of a Pulverised coal fires steam generating unit

It is one of the pulverised coal fires steam generating unit similar to the units erected at Bandel Thermal Power Station. The capacity of an actual unit is 630,000 lbs of steam per hour at a pressure of 1,000 lbs/sq. inch.

38. Model of Thermal Power generating station

This is a model of Central Thermal Electric Plant of France.

39. Hot Air Engine Fan

This is a domestic fan run by a hot air engine. It is operated by hot air produced inside the cylinder by the heat of the hot flue gas of the kerosene lamp. It serves double purpose one as a fan and other as a domestic light for illumination purpose.

40. Modern wind mill

This is a model of modern wind mill, built of metallic structure. This is fitted with a pump illustrating the use of wind power for irrigation.

40. Four number of Sectional Models of Oil Engines.

These models show the working principles of four stroke cycle, two stroke cycle petrol and diesel engines.

41. Gas Engine

This is a four stroke single cylinder, horizontal gas engine, provided with a magneto for sparking and a speed control governor.

43. Kirloskar Diesel Engine

This is a vertical single cylinder, water cooled, four stroke diesel engine. The engine is sectioned at places to show the internal views of the working parts.

44. Hindustan automobile engine

This engine is a prototype morris side valve engine manufactured in 1954 for Hindustan Automobiles. This is a four stroke 4 cylinder, inline water cooled petrol engine, sectioned at different places to show internal parts.

45. Dauphine engine

This is a four stroke, four cylinder, water cooled engine, with overhead valves operated by push rods. These engines are used in Renault's Dauphine cars.

46. Marine Diesel Engine

This is a working model of a marine type diesel engine, with two rows of cylinders, each row containing 8 cylinders. The two crankshafts are connected to the propeller shaft through reduction gears.

47. Sulzer Diesel Engine

This is a model of a two stroke marine diesel engine showing turbo-charging system.

48. Magneto Ignition in a four cylinder engine

This is a working model of magneto showing the sequence of sparking inside a four cylinder oil engines.

49. Heavy Oil Engine

This is a two-cylinder two stroke, semi-diesel type solid injection water cooled oil engine with provision for air starting. It is coupled to a D.C. Generator of 12 K.W. (at 325 r.p.m.)

50. A panel of 7 working models on crank and connecting rod arrangements of oil engines.

This panel shows the different types of crank and connecting rod arrangements in single cylinder, V type double cylinder, one inline one opposed cylinder and one opposed piston type oil engines.

51. Four different types of modern and future oil engines in a panel.

Different types of modern oil engines (Wankel, Heartbeat, Selwood, Rotary piston ) are displayed in this panel to show their working.

52. Bosch Products

18 Nos. of historical products include magnetos, spark plugs, fuel injection pumps, horn etc.

53. Wrights Aero Engine

This is a radial type aircraft engine with 9 cylinders, sectioned at different parts to show the internal views of the engine.

54. Rotating assembly of Rolls Royce Prop Jet Engine

This assembly contains two stages of compressor and rotating blades of the 3 stages turbines of the Rolls Royce Dart Engine.

55. Diorama of a water wheel

This diorama shows a typical horizontal water wheel still in use in the Punjab.

56. Model of Hydro Electric Power Plant over a river.

This is a working model of a hydro electric power plant with overflow spill ways.

57. A panel showing 7 different types of water wheels and turbine runners used to harness water power. These are undershot, overshot, breast-shot, norse mill, Kaplan type, Pelton type, Francis type water turbine runner.

58. Model of a Francis runner

This is of Francis runner of the model turbine similar to the Francis runner of Hirakud I.

59. Model of a Pelton wheel

This is a model of a pelton wheel, with one nozzle. The flow of water inside the nozzle can be controlled by a needle. The model is sectioned to show its internal parts.

contd...



60. Model of Francis Turbine testing plant

This is a working model of vertical Francis type turbine testing plant fitted with a high pressure pump, a dynamo meter, a tachometer, and pressure gauge etc. A model of Francis turbine with arrangement for operating guide vanes etc is mounted in it as a test piece.

61. Model of Feathering Propeller Turbine.

This model shows the working principle of a Kaplan turbine with provision for operating its guide vanes and feathering propellers.

62. Sakuma Dam water turbine

This is a model of a power generating set fitted with a Francis type turbine which is coupled to an alternator above.

63. Lakshapana Hydel model

This is a model of a hydel power station fitted with a Pelton wheel. The location of parts of the turbine, alternator and other accessories are shown by push bottoms operated indicating lamps.

64. Hydro Electric Power Plant (Marshall)

This model shows a panoramic view of a hydro electric power station with a switchyard and transmission system.

65. Transmission of power by belt

This arrangement shows how the power from a shaft is transferred to the other shafts by means of belts.

66. Transmission of Power by means of friction

This arrangement shows how the power is transferred by means of friction from one shaft to another. The panel consists of 6 different types of gears.

67. Link Mechanism in a panel

This panel shows the working of 15 Nos. of different types of links and kinematics.

68. Gear Mechanism in a panel

This panel shows the working of 15 Nos. of different types of gears.

EXHIBITS ON TRANSFORMATION OF ENERGY1. Sun is the source of all energy :-

This exhibit shows Sun as the primary source of energy in our solar system. All planets rotate round the sun and are bound by a force of attraction.

2. Sun is a giant pump :-

This exhibit shows that Sun acts as a giant pump by lifting water from ocean to clouds in the process of evaporation. Water drops down again in the form of rain and thus maintains a constant circulation of water.

3. Water turns a grinding Mill :

Folowing water has energy that drives a water-wheel which again drives a grinding mill. Here energy of water is converted to mechanical energy.

4. Water generates electricity :-

This exhibit shows a miniature model of a hydro-electric plant. Barrange on the river makes a big reservoir of water, which rushes down and spins the turbine and generates electricity.

5. Energy derived by trees :-

Water and sun-rays supply energy to a tree which manufactures food for plants.

6. Wind power - sailing boat and wind mill :-

Wind drives a sailing boat and a windmill. Latter pumps water for irrigation.

7. Muscle power and tools :-

In primitive ages man utilised his own muscle power. Then he invented tools and machines and factories. Here woman is showing using muscle power for working of the husking machine and a man is working in a forging shop.

8. Energy derived by burning coal :-

Enormous sources of energy are there under the soil, in coal and mineral oil. They give light, heat and motive power. This exhibit shows utilisation of coal as fuel for cooking and for mining steam engines. Coal gas is utilised in gas burners in laboratories and industries and also for street illumination.

9. Liquid gold mineral oil :-

Petroleum derives the name of 'Liquid Gold' for its valuable uses. The exhibit shows the uses of mineral oil in kerosens lamps and petrol pumps.

10. Future sources of Energy :-

Enormous natural sources of energy are hidden in the interior of the earth and tidal waves vast oceans. Scientists are trying hard to invent effective means for utilising them.



11. Transformation of energy in our everyday life :-

Energy is transformed from one kind to the other. Solar energy produces crops on which cows feed and give us milk our food which gives energy to man who again cultivates land.

12. Potential energy :-

Any object has stored energy for work by virtue of its position at some higher level. This exhibit, shows, water flowing down from overhead tank, bricks falling from a height, spring in action and pendulum of a clock.

13. Kinetic Energy :-

Objects in motion acquire kinetic energy. The model shows transformation of kinetic energy from one moving object to another by impact, when one iron ball hits out another ball from its state of rest.

14. Work, potential energy and kinetic energy :-

Two forms of energy are shown in this exhibit. Work is done when a weight is being lifted up, by turning a wheel. It falls down with acceleration due to gravity thereby transforming its potential energy into kinetic energy.

15. Electricity is made :-

Wimshurst's machine generates statical electricity of high voltage. Faraday's disc transforms motion to Dynamic electricity.

16. Electricity drives machine :-

This exhibit shows the transformation of electrical energy into Mechanical energy. Electricity drives fans, pumps, and machines like lathe, saw, drilling machine etc.

17. Electricity and Heat :-

This exhibit demonstrates transformation of heat to electricity and back

Electric heater gives heat from electricity and the heat from a small kerosene lamp generates enough electricity to operate a radio.

18. Electricity to light, light to electricity :-

This exhibit shows conversion of electricity to light by means of tungsten and gas lamps. The other part of the exhibit shows conversion of light into electricity by means of a photocell.

19. Sound to electricity, electricity to sound :-

This exhibit shows transformation of sound to electricity as one speaks before a microphone. The small electrical signal is amplified and then a loud speaker gives back the sound again.

20. Sun-rays make electricity :-

This exhibit shows Sun-Rays making electricity in solar cells. They run the instruments of artificial satellites. A small model of Telstar rotates and gives loud 'bleep bleep' signals when the solar cell installed in it, forces the sun.

21. Electromagnet :-

An electromagnet is seen attracting a bunch of safetypin. Its utilisation in lifting heavy materials in factories is shown by a precision working model of an electromagnetic crane.

22. Electromagnetic energy :

Light, X-rays and radio-waves are electromagnetic radiations, which do not need a medium to travel. The animated exhibit shows radio waves travelling in space from a transmitter tower to the receiving antenna.

23. An atom has enormous power :-

The animated exhibit shows the utilisation of nuclear energy due to fission for generating electricity in a nuclear power reactor.

An animated inserted slide shows the principles of chain reaction which occurs in a reactor.

24. Chemical energy and electrical batteries :-

Transformation of electrical energy to chemical energy (charging) as indicated by rise in specific gravity of sulphuric acid and again transformation of chemical energy to electrical energy (discharging) by falling in specific gravity of sulphuric acid. This exhibit also shows a sectional view of the storage battery mainly used in automobiles.

25. Steam drives engine :-

This model shows working of a steam engine, shows here transformation of Thermal Energy into Mechanical Energy by use of steam, thus driving the engine.

26. Petrol drives engine :-

Two Sectional models of two stroke and four stroke petrol engines explain their working. Here one finds transformation of chemical energy to Mechanical energy.

27. Diesel drives engine :-

This exhibit explains the working principles of a two stroke and a four stroke diesel engines, explaining their working.

28. Space Rocket :-

The last exhibit is the model of a space rocket. With the help of certain chemicals the produced heat energy forces the rocket with tremendous speed to space.



EXHIBITS OF TEMPORARY EXHIBITION.1. Polaroid Picture :

Polarised light passing through a double refracting medium splits into two components and while again passing through a polaroid sheet recombines to produce light of different colours.

2. Ripple Tank :

The wave forms and the pattern produced when they cut are studied in this model.

3. Carbon atom :

A three dimensional model showing the nucleus and electrons in different shells. Movement of the electrons is shown by light points.

4. Subtraction of colour:

When disc of red, blue and yellow are made to overlap against a white background, the overlapped portion appears ~~xxx~~ black.

5. Addition of colour :

When lights of colours red, blue and yellow are projected on a screen, so as to overlap, the overlapped portion appears white.

6. Newton's disc:

Light, consisting of seven colours is demonstrated by painting a disc in proper proportions with the seven colours. On rotating it, white colour only is seen.

7. Burglar's alarm:

A warning to the house owner is given by the sound of a bell, when a burglar tries to tamper with the safe.

8. Illusive Doll

The doll evades the touch of an ~~intruder~~ intruder a model operating on the capacitance variance due to the human body.

9. Patience tester.

A ring to be taken along a curved wire without touching it. An alarm sounds on contact.

10. Magic Picture :

A picture so drawn that while half the portion of it is covered, it reads one word and when fully opened some other.

11. Shoot the Tiger

A gun, when shot projects a light spot. This spot, if it falls directly into the mouth of a tiger placed a few feet away, operates a photo electric circuit and a bell sounds and the tiger falls down.

12. Jumping Disc

Due to eddy currents formed when alternating current passes through a coil of wire the disc is thrown up.

13. Transfer of mementum

The momentum of a body in motion is transferred to another with which it comes in contact. So contacted if a number of balls be placed only the last at the other end moves.

Annexure 4

LIST OF SELECTED EXHIBITS DISPLAYED

AT THE SAMPLE SCIENCE MUSEUM

<u>Name of Exhibit</u>	<u>Supplied by</u>
1. Original D.C.Motor of 1888 and the Replica of Simen's Dynamo.	Birla Industrial & Technological Museum, Calcutta.
2. Scale model of Watt's steam engine.	- do -
3. Working model of a coal mine "Cutter Loader"	- do -
4. A panel of gear mechanisms	- do -
5. An exhibit demonstrating Lissajous figure	- do -
6. A polaroid technamation (an animation technique of a sample science museum)	- do -
7. Original sectionised Kirloskar's 5 BHP Diesel engine	Visvesvaraya Industrial & Technological Museum, Bangalore.
8. A panel of crank arrangements	- do -
9. An exhibit on "Concept of Power "	- do -
10. "Barlow"s wheel" an exhibit to demonstrate the fundamentals of electricity.	- do -
11. A diorama of persian wheel showing animal power.	- do -
12. An animated exhibit showing the "Chain Reaction" in Nuclear Physics.	- do -
13. An animated exhibit showing the London-Delhi Radio Telephone Link.	- do -
14. Two panels containing photographs on Birla Museum, Calcutta and Visvesvaraya Museum, Bangalore - Architecture and the various technical galleries.	
15. A scale model of the proposed New Building of the Birla Museum, Calcutta.	